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CHEM-BIO SELF-DECONTAMINATING SURFACES (BRIEFING SLIDES)

AFRL QUARTERLY SUMMARY ON DARPA EFFORT

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Technical POC: Joe Wander, AFRL/RXQL. Document contains color images.

14. ABSTRACT

A slide show describing progress to 5 Dec 2007 toward reproducibly contaminating sensitive equipment items and measuring the efficacy of different surface treatments as countermeasures to bioaerosol contamination. A small contamination chamber was fabricated and shown to achieve good reproducibility delivering Bacillus atrophaeus spores (13.6% coefficient of variation). Successful delivery (CV = 7.2%) of Staphylococcus aureus at 10e4/sq cm was also achieved in the small-scale chamber by aerosolization in a medium containing 1% raffinose. Batch contamination of larger items (hand-held electronic devices) was achieved by placing them inside a bioaerosol test chamber that is regularly used to deliver aerosols for filter challenge studies and arresting airflow overnight after steady-state bioaerosol concentrations were established. Loadings larger than 10e4/sq cm were again achieved. A direct extraction procedure with mechanical agitation was used to recover B. atrophaeus spores from glass slides used as controls, and two methods, HEPA vacuum and rayon gauze wipes were used to recover spores from treated and untreated calculators. HEPA recovery was both less convenient and less efficient but CVs for both methods were less than 4%.

15. SUBJECT TERMS

reactive surfaces, microorganisms, self-sterilizing, hydrophobic, hydrophilic, bio-efficacy

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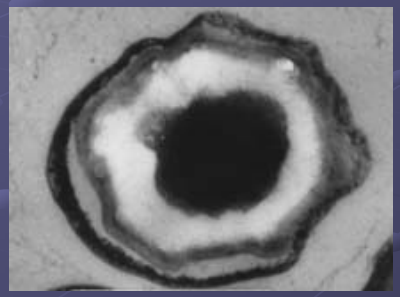
Chem-Bio Self-Decontaminating Surfaces

AFRL Quarterly Summary on DARPA Effort

December 5, 2007



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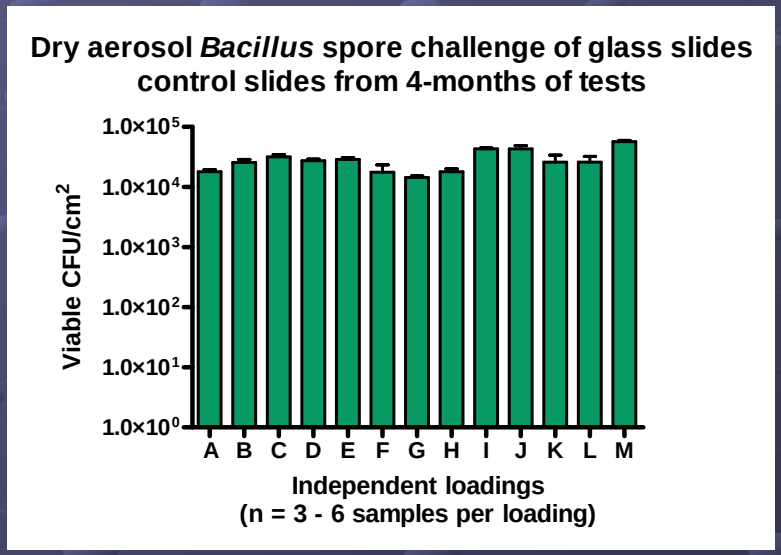
Coupon Test Method Development

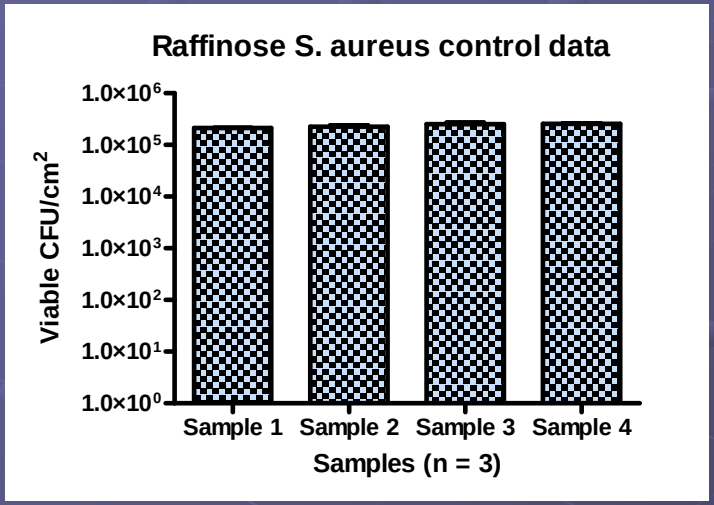
Small scale aerosol test stand was optimized to deliver *Bacillus atrophaeus* spores to glass coupons



- Loading times < 5 minutes per set of samples
- All experiments exceeded 10^4 CFU/cm^2
- Average Coefficient of Variation (CV) = 13.6%

Coupon Test Method Development

Small scale aerosol test stand was optimized to deliver viable *Staphylococcus aureus* to glass coupons



	Initial Plating	1-hour incubation	Ratio
Average	2.70E+05	2.36E+05	87.4%

Average death that occurs over the 1-hour incubation period due to desiccation = 12.6%

- Nebulization solution - 1% raffinose
- Loading times < 5 minutes per set of samples
- All experiments exceeded 10^4 CFU/cm^2
- Average Coefficient of Variation (CV) = 7.2%

“Large Item” Test Method Development

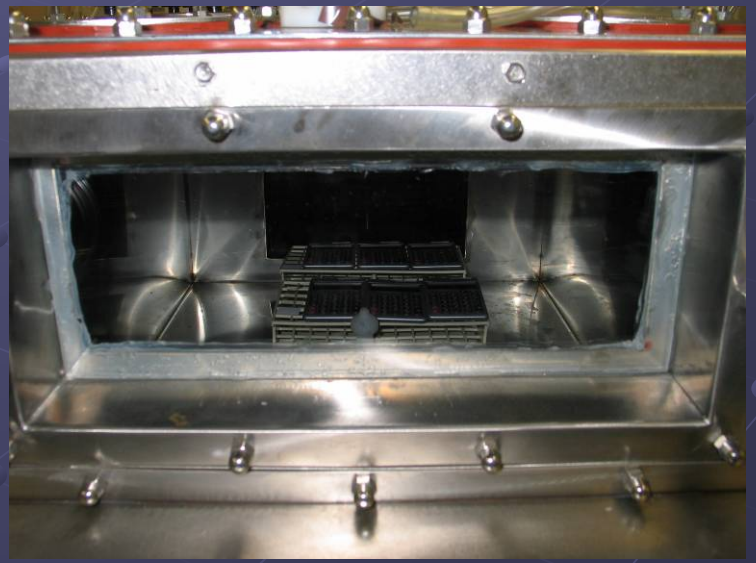
AFRL Biological Aerosol Test System (BATS) used to deliver spores

- 6-jet Collison nebulizers generate the biological aerosol
- BATS has a temperature and humidity controlled plenum chamber
- “Large items” are placed on the floor of the plenum chamber and spores are allowed to settle onto the items

“Large Item” Test Method Development

- Calculators were used as “mock” items to mimic the actual test articles
- Glass slides were used to determine extraction efficiency
- *Bacillus atrophaeus* spores were aerosolized into the BATS for 30 minutes then allowed to settle overnight

Sample set up

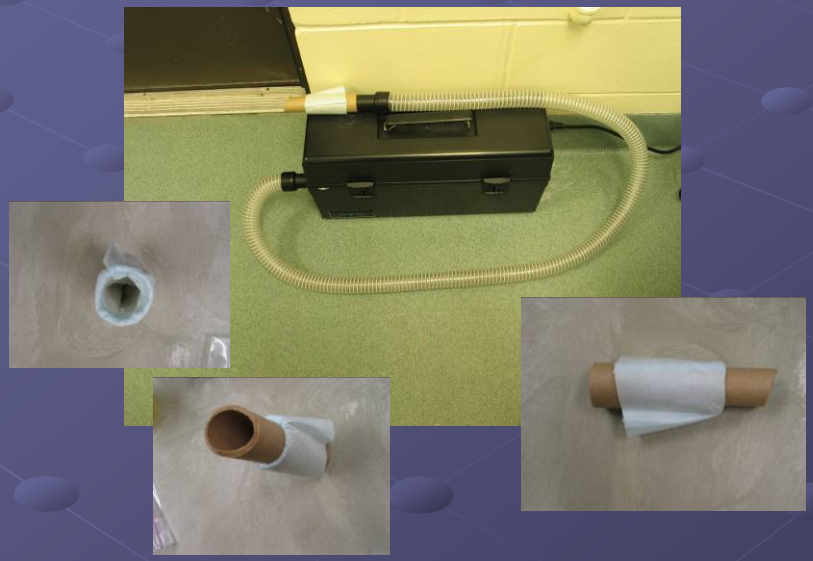


View inside of BATS

“Large Item” Test Method Development

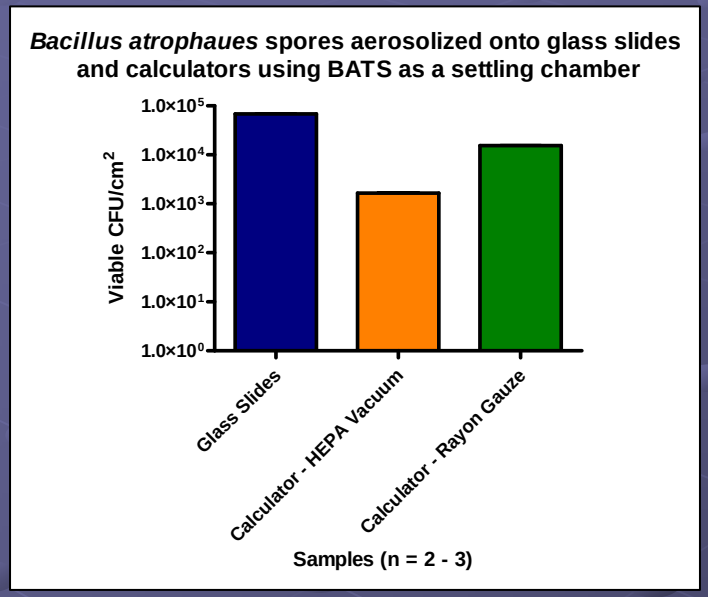
- Glass slides were sampled by suspending in 50 mL of 0.3% Tween-20
- Calculators were extracted by:

  1) HEPA vacuum
  2) Rayon gauze wipes (wetted with 0.3% Tween-20)



“Large Item” Test Method Development

Preliminary Results (only one test)



Samples	CFU/cm^2	% Recovery	CV*
Glass slides	6.85E+04	----	0.5%
Calculator (HEPA Vacuum)	1.66E+03	2.42%	3.2%
Calculator (Rayon Gauze)	1.54E+04	22.52%	2.7%
*Coefficient of Variation			

- Loading goal of 10^4 CFU/cm^2 was achieved
- Coefficient of variations were very low
- Rayon gauze outperformed HEPA vacuum

- Work will continue to optimize sampling efficiency
- Sampling protocol will be changed for HEPA vacuum to increase sampling